

Description of two new *Homoeocera* Felder from Guatemala and Mexico (Lepidoptera, Arctiidae, Arctiinae, Euchromiini)

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Abstract

Two new species of *Homoeocera* Felder from Central America are described from high-altitude, humid localities in Mexico and Guatemala, *Homoeocera georginas* **sp. n.** and *H. papalo* **sp. n.** Both are compared to the closely related *Homoeocera gigantea* Druce. Illustrations of adults and male genitalia of the three species are provided. The generic placement within the genus *Homoeocera* is discussed.

Keywords

Euchromiini, Arctiidae, Neotropics, taxonomy, *Homoeocera*.

Introduction

The general classification of the Noctuoidea superfamily followed throughout this work is that of Mitchell et al. (2006) established on nuclear genes rather than the less traditional and more controversial classification proposed by Lafontaine and Fibiger (2006). At the tribe level the classification used follows the recent works of Kitching and Rawlins (1998) and Jacobson and Weller (2002).

In 2007, I had the opportunity to collect in Guatemala in very well preserved localities which gave a slight idea of the richness of this country around the end

of the 19th century when the large work “*Biologia Centrali-Americana*” was written (Druce 1881–1890a). Even though Guatemala has been largely explored since 1850, it is obvious that many new species of Lepidoptera are continually awaiting description.

During this trip, we spent two nights at Fuentes Georginas, Quetzaltenango, a high altitude (2460 m) locality with cold and very wet weather. We were surprised to find two different species of *Homoeocera* Felder in abundance: one larger species with wide black wing margins and clear transparent wings, and a second, smaller species with narrow black margins and yellowish transparent wings. Moreover, the smaller species displays conspicuous yellow intersegmental abdominal lines whereas the large one displays bright blue lines (Fig. 1).

The genus *Homoeocera* was created by Felder in 1874 for a single species, *H. crassa* Felder, 1874 (*op. cit.*, Pl. 102, fig. 26) and for the moment contains between 8 and 24 species depending of the accepted limits of the genus (Draudt 1915; Global Lepidoptera Names Index website; Global Diversity Information facility website). The two species found in Guatemala are very similar to *Homoeocera gigantea* Druce, 1884, described in the first volume of “*Biologia Centrali-Americana*” (Druce 1884: 54, plate VIII fig. 5) based on a single female specimen from Costa Rica (Van Patten leg.). Later, in the second volume, Druce added two more localities: Guatemala from a specimen in Staudinger collection (Conradt leg.) and Guatemala City (Rodriguez leg.) (Druce 1897 p. 341). The holotype is in the general collection in BMNH in London (specimen examined). It is interesting to note that in addition to the type in the BMNH, there is a male from Guatemala bearing the label: Guatemala, Santa Maria, 5500', Sept, 1919–266.

Following this study it was clear that the two entities found in Guatemala represent two quite distinct species, the larger one having genitalia similar to *Homoeocera gigantea* from Costa Rica. Moreover it was also found that specimens from Oaxaca State in Mexico, also at high altitude, represent a new species different from the two species found in Guatemala. These two new species are described in the present work.

Methods and materials

Adult genitalia were prepared by boiling abdomens 15 minutes with 2 pellets of potash in 5 ml of water. After rinsing with water and then alcohol, genitalia were photographed in a natural position suspended in 95% alcohol. Types and museum specimens were mounted in Euparal, and remaining specimens were stored in glycerol in Eppendorf tubes. Photos were taken with a CoolPix 4500 Nikon camera attached to a trinocular Nikon stereomicroscope SMZ-10A.

In order to check the exact distribution of each species, specimens were dissected from as many localities as possible. Specimens from the collection of Xavier Lesieur

were included (Honduras and Mexico) and specimens originating from Mexico, Guatemala, Honduras and Costa Rica were dissected.

Three specimens each of *H. gigantea* and *H. georginas* were sequenced and analyzed using the barcode fragment of the mtDNA COI gene (BOLD: Barcode of Life Data Systems). DNA was extracted from legs of dried specimens in the collection of the author, then amplified and sequenced at the “Canadian Centre for DNA Barcoding” (CCDB) in Guelph, Ontario. Extraction, amplification and sequencing protocols can be found on the CCDB website (<http://www.dnabarcoding.ca/page/research/protocols>) and are also described in Vaglia et al. (2008).

Repository abbreviations are as follows:

BMNH	The Natural History Museum (formerly British Museum [Natural History]), London.
DVUC	Del Valle University, Guatemala City, Guatemala.
JMC	Personal collection of José Monzon, Guatemala City, Guatemala.
MNHN	Museum National d’Histoire Naturelle, Paris, France.
MLC	Personal collection of Michel Laguerre, 33850 Léognan, France.
USNM	National Museum of Natural History (formerly United States National Museum), Washington, D.C., USA.
XLC	Personal collection of Xavier Lesieur, 95880 Enghien-les-Bains, France.

Systematics

***Homoeocera gigantea* Druce, 1884** In: Druce (1881–1890): 54 pl. VIII Fig. 5. Figs 2a, 2b, 3a–f

Diagnosis. Generally speaking a robust and handsome species well characterized by clear (not yellowish) transparent wings with black borders and crimson red legs. Most similar to *H. georginas*; see Diagnosis under that species.

Description. Head, collar, tegulae, thorax and antennae deep black. Abdomen above entirely black with bright blue intersegmental lines, difficult to see on dried specimens. Forewing length 21–24 mm (n = 13). Forewings transparent and entirely bordered by a thin black line (around 0.3 mm) with a small indentation on vein CuA2. Base of the wings largely black. Black line at the end of the cell reaching the costa. Hindwings reduced, entirely transparent, with termen bordered with a thin black line. Border wider along anal angle and with a small indentation just above the anal angle. The immediate basal area black.

The underside is almost identical to the upperside, palpi are entirely red; hindwings with a milky white iridescence just inside the anal border; all legs are crimson red except the tarsi which are dark-brown. There is a white depression at the base of the ventral abdomen in males.



Figure 1. *Homoeocera gigantea* (left) and *Homoeocera georginas* sp. n. (right) at rest, the same night, on the collecting sheet at Fuentes Georginas, Quetzaltenango, Guatemala (V. 2007).

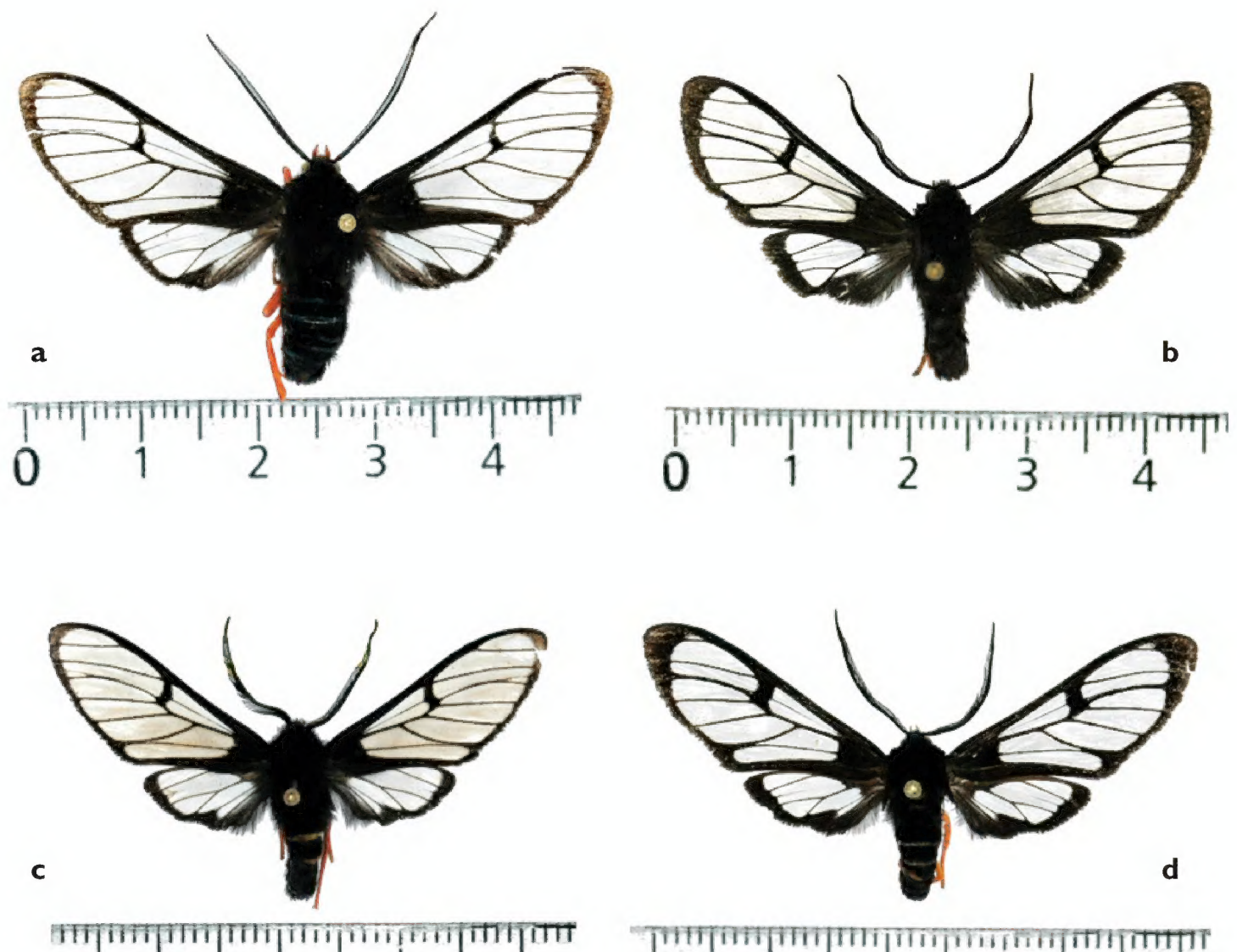


Figure 2. **a** *Homoeocera gigantea*, from Costa Rica, Cartago, Tapanti, X.1985 **b** *Homoeocera gigantea* from Guatemala, Quetzaltenango, Fuentes Georginas, 2460 m, 9.V. 2007, M. Laguerre leg. **c** *Homoeocera georginas* nov., from Guatemala, Quetzaltenango, Fuentes Georginas, 2460 m, 9.V.2007, M. Laguerre leg. **d** *Homoeocera papalo* nov., from Mexico, Oaxaca, Concepcion Papalo, 2275 m, 10.VII.1997, G. Nogueira leg.

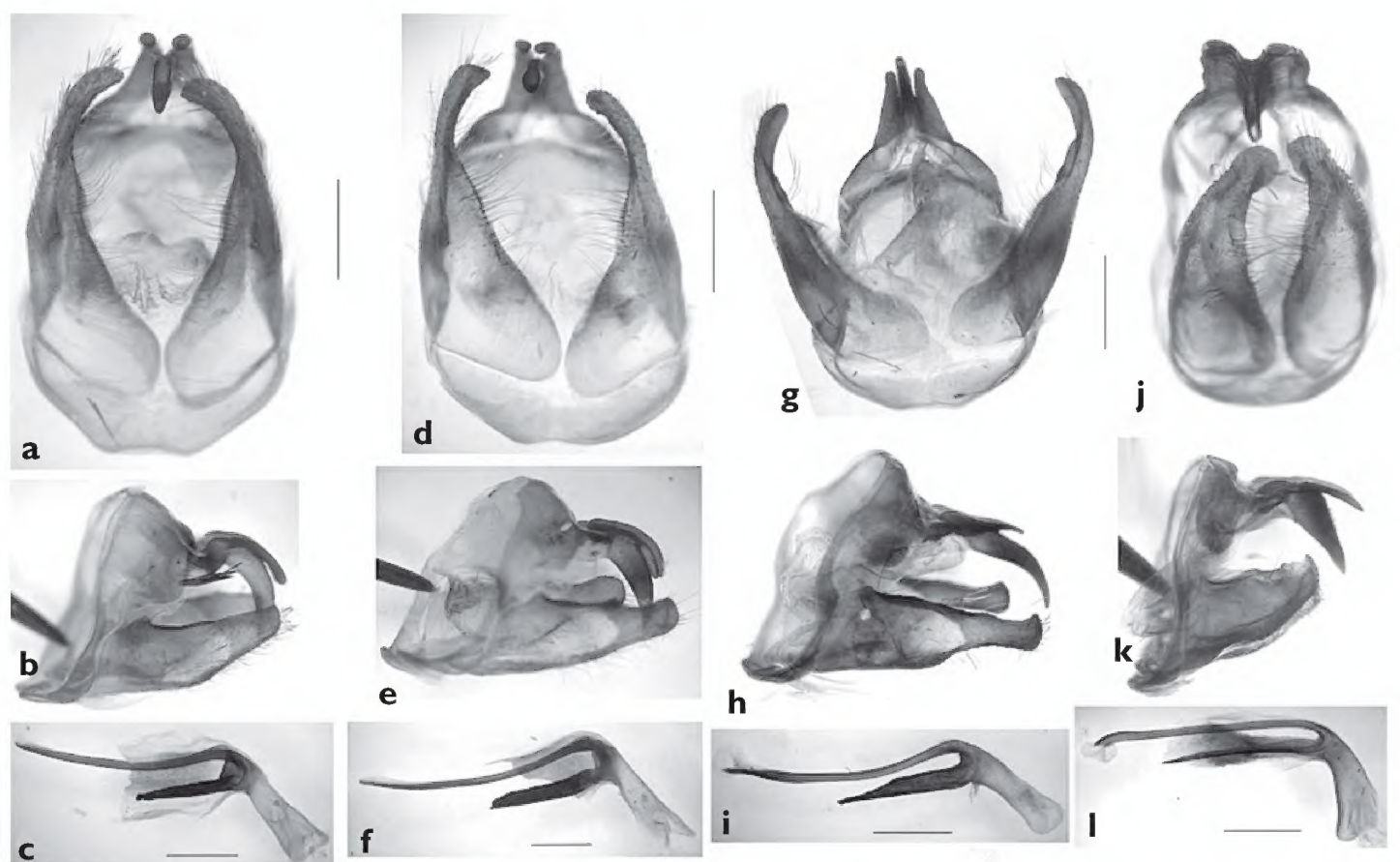


Figure 3. *Homoeocera* male genitalia with successively: ventral view, lateral view, penis in lateral view, all in natural positions for: **a–c** *H. gigantea* from Costa Rica **d–f** *H. gigantea* from Guatemala **g–i** *H. georginas* sp. n. from Guatemala **j–l** *H. papalo* sp. n. from Mexico. Scale bar = 1 mm.

Specimens examined. GUATEMALA: Quetzaltenango, Fuentes Georginas, 11 & 12.V.2007, 2460 m, 14° 45.008 N – 91° 28.820 W, M. Laguerre *leg.*, 7 ♂, one has been dissected Gen. ML1558, two have been bar-coded, GenBank accession numbers GU332713 (BOLD no. ARCTB327-08 / MILA0986) and GU332714 (ARCTB351-08 / MILA1010). All M. Laguerre *leg.* Zacapa, S.E. La Union, 15-V-2007, 1400 m, 14° 57.152 N' 89° 16.690' W, GenBank GU332715, BOLD no. ARCTA774-07 / MILA0493, M. Laguerre *leg.*, 1 ♂. Suchitepéquez, Atitlan Reserve, Refugio del Quetzal, I-2009, 1570 m, 14° 32.873' N 91° 11.610' W, J. Monzon *leg.*, 1 ♂. San Marcos, Finca Esperanza, 1950 m, 30.V & 1.VI.2008, 14° 56' 03.6" N – 91° 51' 41.1" W, J. Touroult *leg.*, 3 ♂. [all in MLC]. **HONDURAS:** Prov. Morazan, 24 km NE Tegucigalpa, La Tigra, 1000 m, VI.1995, Porion / Lachaume *leg.*, 3 ♂, one dissection # Gen. ML1788 [XLC]. **COSTA RICA:** Cartago, Tapanti, X.1985, Gen. ML1678, 1 ♂. COSTA RICA, San Jose, Cerro La Muerte, Paraiso del Quetzal, 2722 m, 14.IX.2009, 09° 38' 40.10" N – 83° 51' 01.09" W, D. Herbin *leg.*, 3 ♂ [MLC].

Distribution and biology. As far as is known, *H. gigantea* is distributed from Guatemala to Costa Rica, generally at high altitude in very humid biotopes. It is not presently known from Nicaragua possibly because collecting at high altitude is difficult due to the topography of the country. The biology is unknown.

Remarks. Specimens from Guatemala and Honduras exhibit wider black wing borders compared to Costa Rican specimens, but the genitalia are similar. DNA barcode divergence between *H. gigantea* and *H. georginas* samples is approximately 3.8%.

***Homoeocera georginas* Laguerre, sp. n.**

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Figs 2c, 3g–i

Type material. Holotype: 1 ♂, GUATEMALA, Quetzaltenango, Fuentes Georginas, 11 & 12.V.2007, 2460 m, 14°45.008 N – 91°28.820 W, M. Laguerre *leg.* [printed white label] / Gen. ML1539 [hand-written white label] / MILA0966 [printed yellow label] / HOLOTYPE [printed red label]; GenBank accession no. GU332717, BOLD access code ARCTB307-08 / MILA0966 [MNHN]. **PARATYPES** (21 ♂): **GUA-TEMALA:** same data as holotype, 9 ♂, one has been dissected: Gen. ML1833, two specimens have been bar-coded, GenBank accession no. GU332716 (BOLD access codes ARCTB335-08 / MILA0994) and GU332718 (ARCTA791-07 / MILA0510, dissection Gen. ML1833), all M. Laguerre *leg.* [MLC]. Same locality as holotype, 9 ♂, 02.VII.2008, José Monzon *leg.*, [JMC]; 1 ♂, same locality as holotype but 27.IX.2006, Monzon, Heppner & Sutton *leg.*, [JMC]; 2 ♂, same locality as holotype but 24–25. VIII.2001, A. Bailey & J. Monzon *leg.* [DVUC]. One paratype will be deposited in BMNH and USNM.

Etymology. The name is a reference to the type locality: Fuentes Georginas, a popular spot with hot springs high in the mountains on the Pacific slope.

Diagnosis. Similar to *gigantea* but less robust species with a yellow cast on forewings and very characteristic deep crimson red legs. By comparison *H. gigantea* is a larger and more robust species well characterized by the wider black margin of the fore- and hindwings. There is no yellowish cast on the forewings, the black indentation in space 2 of the hindwings is more pronounced, the abdomen upperside has a bluish hue with blue intersegmental lines (very difficult to see on dried specimens), the tip on the antennae below are not white, palpi are red not black.

In *H. gigantea*, the uncus is shorter and wider, the lateral protuberances are longer, wider and rounded (tapered in *georginas*) in lateral view, cylindrical in ventral view. The valvae are asymmetrical, the left one being slightly longer than the right one which reaches the base of uncus. The tegumen is a little wider, the concavity more pronounced and always without saccus. In the aedeagus, the ventral process is less than half the length of the upper process (greater than half in *georginas*), narrower but more sclerotized (almost black), and the apex of the ventral process is abruptly cut, not tapered as in *georginas*.

Description. Female unknown. Head, collar, tegulae, thorax and antennae deep black. Abdomen above entirely black with yellow intersegmental lines, difficult to see on dried specimens. Forewing length 18–20 mm (n = 10). Forewings transparent with a slight yellowish cast and entirely bordered by a thin black line (about 0.5 mm) with a small indentation on vein CuA2. Base of the wings largely black. Black subrectangular spot at the end of the cell reaching the costa. Hindwings reduced, entirely transparent, with termen bordered with a thin black line but without the yellowish cast. Border wider along anal angle and with a small indentation just above the anal angle. The immediate basal area black.

The underside is almost identical to the upperside, except the tip of the antennae which is white, palpi are entirely black, there is a milky white iridescence just inside the anal border on the hindwings and all legs are deep crimson red except the claws which are dark-brown.

Male Genitalia (Fig. 3g–i): Uncus long, pointed and curved downward, like a bird beak with a protuberance on each side. In lateral view these protuberances are very slender with a total length less than half the length of uncus. In ventral view, these protuberances have a rounded and almost cylindrical appearance. Valvae are symmetrical slightly curved inward and slightly spatulate at tip, reaching the middle of uncus. Tegumen slightly concave and without saccus. Adaegus very characteristic, divided into two distinct parts: an upper one, long, thin, slightly curved upwards and bearing a small smooth vesica and a lower part slightly longer than half the upper one, wider and strongly sclerotized, corrugated and with a bevelled extremity.

Distribution and biology. For the moment, known only for a restricted area in Guatemala, on the Pacific slope, at high altitude. Biology is unknown.

Remarks. Although sample size of barcoded specimens is small, the relatively large genetic divergence between *gigantea* and *georginas*, at about 3.8%, fully support the recognition of these taxa as separate species.

Homoeocera papalo Laguerre, sp. n.

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Figs 2d, 3 j–l

Type material. Holotype: 1 ♂, MEXICO, Oaxaca, Concepcion Papalo, 2275 m, 10.VII.1997, G. Nogueira *leg.*, (white printed label) / Gen. ML1672 (white handwritten label) / HOLOTYPE (red printed label) ; deposited *in* MNHN, Paris.

PARATYPES (7 ♂): 1 ♂, same data as holotype [MLC]. **MEXICO:** Oaxaca, Road Tuxtepec-Oaxaca, PK 86, 1750 m, VII.1992, J. Haxaire *leg.*, 6 ♂, one dissected: Gen. ML1789. [XLC].

Etymology. The name is a reference to the type locality, Concepcion Papalo, a small city in north east Oaxaca state. The name Papalo means butterfly.

Diagnosis. Similar to *gigantea* but a less robust species with elongated forewings and orange red legs. *H. papalo* sp. n. is intermediate in size between *gigantea* and *georginas*, but the forewings are obviously narrower and elongated. There is no yellowish cast on the forewings as in *georginas*, however the underside tip of antennae is white as in *georginas*. Palpi and legs are orange not deep crimson red as in *georginas* and *gigantea*. The genitalia of *H. papalo* are also very distinct from the two other species. Here, the lateral protuberances of the uncus have a very different shape, the symmetrical valvae are very short, not reaching the base of uncus. The adaegus has two long lobes of similar length, whereas the lobes are very obviously of different lengths in *gigantea* and *georginas*.

Description. Female unknown. Head, collar, tegulae, thorax and antennae deep black. The collar displays a metallic bright blue cast. Abdomen deep black upperside

with bright line at the end of segments. Forewing length 20–21 mm ($n = 2$). Forewings elongated, transparent, entirely bordered by a black line wider than in *H. georginas* sp. n. specially at apex where it is enlarged and presence of a small indentation on vein CuA2. Base of wings is largely black, the subrectangular cellular spot at the end of the cell is large and conspicuous. Hindwings transparent, black border wide except on costa with an indentation on vein CuA2. The extreme base black. Underside similar to upperside, tip of the antennae white, palpi and legs orange. A milky white iridescence just inside the anal border on the hindwings.

Male Genitalia (Fig. 3 j–l). Uncus conical, stout and pointed, with a protuberance on each side. In lateral view these protuberances are very slender with a total length exceeding half the length of uncus. In ventral view, these protuberances are semi-circular not unlike “ears”. Valvae are symmetrical, slightly curved inward and spatulate at tip, not reaching the base of uncus. Tegumen rounded and without saccus. Adaegus very characteristic, divided into two distinct parts: a dorsal long, thin, rectilinear process with the apex slightly curved downward and bearing a small smooth vesica and a ventral thin, pointed process reaching about $\frac{3}{4}$ length of the dorsal one.

Distribution and biology. Currently known only from a very restricted area in Oaxaca state in Mexico, at high altitude. The biology is unknown.

Discussion

The three species discussed here constitute a very homogeneous group in both habitus and genitalia. This study adds data to the BOLD project, which aims to build a DNA barcode database of all macrolepidoptera (Hebert et al. 2003), and a campaign targeting the neotropical Arctiidae has been initiated. To date, more than 2200 sequences accounting for about 750 species (i.e., more than 10% of currently described neotropical Arctiidae) from at least 16 countries have been analyzed.

The main problem in *Homoeocera* seems to be the correct generic assignment of this group of species. When he described *gigantea*, Druce included this species within the genus *Gymnelia* Walker near *torquata* Druce, which he had described sometime earlier (Druce 1883). In 1898, Hampson transferred *gigantea* to *Homoeocera* Felder whereas in 1914 he transferred *torquata* to *Dassysphinx* Felder. What is clear from dissection of the generotype of *Homoeocera* (i.e. *crassa* Felder) is that the three above species are not congeneric with *crassa*. Furthermore, based on the habitus, *torquata* seems misplaced within the genus *Dassysphinx*, but together with the three species treated here, *tarsipuncta* Schaus, *garleppi* Rothschild and *ockendeni* Rothschild (all three presently included within *Dassysphinx*) seem to constitute a rather homogeneous group. A correct generic assignment of all these species requires a complete revision of the genus *Homoeocera*, which is far beyond the scope of this work. It seems prudent at the moment to maintain the *status quo* and assign the two new species to the genus *Homoeocera*.

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